

There is no doubt that the kind of first course laid out in this book is the right one from a psychological point of view. A quite young pupil, actually carrying out its directions with the help of a sympathetic teacher, will obtain clear conceptions of geometrical facts in a way that is really interesting and fruitful. The apparatus required is of the simplest possible kind—paper, pins, a pencil, and a pair of scissors are all that are absolutely necessary, though a compass and a scale might be provided with advantage, except at the beginning of the course. The attention given to solid figures is a feature which deserves commendation; and above all there does not seem to be anything said that is likely to lead to misapprehensions, which have to be painfully corrected afterwards.

There are a few points of detail which might be attended to in another edition. The letters in the diagrams are too small; the figure on p. 151 does not correspond to the text; on p. 35, "This gives us another axiom" is quite illogical; and there are some technical terms which might have been spared. It must be remembered, too, that this is not a book for a beginner to *learn* in the old-fashioned way; it is intended to make him experiment and think, and the guidance of the teacher is essential. Assuming this, the book ought to be very useful, and lead to good results, even in the case of pupils who have little faculty for demonstrative geometry.

G. B. M.

LEGIBILITY AND VISUAL ACUITY.

Physiologie de la Lecture et de l'Écriture. By Emile Javal. Pp. xv+296. (Paris: Félix Alcan, 1905.) Price 6 francs.

THE title of this book, which is written by a distinguished ophthalmologist, is somewhat misleading. One would naturally expect such a work to deal with the neuro-muscular mechanism, central and peripheral, of reading and writing. In reality, it treats almost exclusively of the legibility of printed and written matter, and the physiological processes are investigated only in so far as they throw light upon this aspect of the subject, and give indications for increased facility and rapidity in reading.

In the first part of the book a brief historical account of epigraphy, writing, typography, stenography, musical notation, and writing in relief for the blind is given. Typography is illustrated by examples from Garamond (1540), adopted by Plantin, of Antwerp, and the two Elzeviers, of Leyden and Amsterdam respectively, from very elegant designs by Jaugeon (1704), and from the Imprimerie Impériale (Didot, 1811) and the Imprimerie Nationale (Marcellin Legrand, 1847). Theoretical considerations of visual acuity, treated in the second part, show that the visibility of a letter increases indefinitely with the illumination, whereas its legibility depends upon the neuro-epithelial mosaic of the retina, and is therefore independent of illumination above a certain minimum. Investigation of the mechanism of reading a line of print has shown that the eyes move in a series of

jerks, in each of which a group of about ten letters is appreciated, the grouping being independent of the distance of the book from the eyes so long as this is consistent with legibility. Bar reading gives some indication of the relative part played by the two eyes when binocular vision is present. The difference of accommodation in different parts of a line when the book is held close to the eyes, as in myopia, is very appreciable, and must be taken into account in treatment; thus in a myope of 15 dioptries a line of 10 centimetres involves a difference of accommodation of about 7 dioptries. The characteristic features of letters are for the most part in the upper portion, so that attention is specially directed here; consequently it is easy to read with the lower halves of the letters covered, whilst the reverse occasions considerable difficulty. These considerations indicate some improvements in typography. They have been carried out in some designs prepared for the author by M. Ch. Dreyfuss. It will be admitted that the result is successful as regards legibility and rapidity of reading, though at no small cost to the artistic sense. M. Javal points out that nearly all the improvements are to be seen in the well known enamelled-iron advertisement of Willing; indeed, English printing as a whole compares favourably in his estimation with that of other countries.

The terrible misfortune of blindness overtook the author a few years ago, so that it is not surprising that he has given much attention to Braille type. Even those born blind rarely attain to a rate of 100 words a minute in reading, or 10 in writing. It is surprising to find that the tactile acuity of the blind is actually less than that of normal people; the reading finger tires rapidly, and though the acuity of other fingers is greater, they are comparatively useless for reading. The author gives valuable suggestions for improving and simplifying Braille type, as well as general instructions as to the hygiene of vision and of writing.

J. HERBERT PARSONS.

OUR BOOK SHELF.

Exercises in Quantitative Chemistry. By Harmon Northrop Morse. Pp. xx+356. (Boston and London: Ginn and Co., 1905.) Price 8s. 6d.

THE time when the sole desideratum in the training of the chemical student was the acquirement of greater or less proficiency in the processes of analytical chemistry has, happily, gone by. Courses of experimental work arranged with the view of familiarising him with the most important general reactions, the preparation of typical organic compounds, and the methods peculiar to physical chemistry are now recognised as the essentials of chemical training. The work under review has been written from this standpoint, and makes no attempt to present a course of work for the training of expert analysts.

Although much diversity of opinion must necessarily attach to the problem of the choice of an ideal course of exercises, the unbiased critic can have but little fault to find with the author's selection. At first sight the heterogeneous character of the sixty-four exercises creates an impression of a lack of systematic arrangement, but this is more apparent than real. The first eight chapters deal with the balance, the

barometer and thermometer, the calibration of apparatus for the measurement of liquids and gases, the preparation of standard solutions, the determination of specific gravity and molecular weights, and with the purification of substances. Analytical exercises involving gravimetric and volumetric measurements and the manipulation of gases are contained in the succeeding twelve chapters, the selection being such that the student acquires familiarity with a large number of different kinds of operations. Chapters dealing with the electrolytic determination of metals, the analysis of butter, and electrical heating appliances for laboratory use complete the work.

Much care has evidently been devoted to the text. The remarks on p. 167 in reference to Victor Meyer's vapour-density method are, however, quite unintelligible, and in the methods of butter analysis described no mention is made of the standardised apparatus and method of working which has been adopted in this country for the determination of the volatile acids. These, however, are blemishes of small import, and the book represents an addition to laboratory literature to which attention may be directed with confidence.

H. M. D.

Handbook of Physiology for Students and Practitioners of Medicine. By Dr. Austin Flint. Pp. xxvi+877 and xvi plates. (London: Macmillan and Co., Ltd., 1905.) Price 21s. net.

THERE are reasons for congratulating the author of this book upon its appearance, and not the least of them is the cheery optimism everywhere displayed. The growth that has taken place in the subject in the course of the last half-century is no more remarkable than the courage with which this writer, at the end of that time, turns round to attempt its description. To old friends of his handbook this gallant effort must afford great pleasure. It is doubtful, however, whether, outside this circle, much influence can be anticipated for this volume, since it has many competitors appealing more directly to the market of the present time.

"It is the outcome of a desire to connect pure physiology with the physiology specially useful to physicians." Let it be said that there is but one physiology. The physiology, which is of use to medicine, is not an applied science with a wealth of knowledge accumulated in its special interest; it is the essence of the pure science of physiology. There are also anatomy and histology. It is useless to claim credit from an attempt to provide a judicious blend of these separated subjects, since they are now more conveniently, and usually, studied separately. In this case, also, the standard of the extraneous matter is such as in no way to raise the standard of the general contents of the book.

As to the treatment of the more legitimately included contents, much can be said briefly.

The additions which have been made to knowledge in the last twenty years have made their bow to the author of this book, and have had the honour of an introduction. The names on their visiting cards have been forgotten; their inventions have been expressed at such hurried interviews as frequently to have escaped comprehension. The fact that they have called in such numbers has, however, made an impression, of which this new edition forms the record. The additions of recent years are, however, of such importance that nothing short of a complete—even if concise—consideration of their nature will suffice. The kindly sketched shadows, which here vaguely occupy the space that ascertained facts should definitely fill, render it impossible to recommend this book for general reading.

J. S. MACDONALD.

NO 1890 VOL. 73]

Penrose's Pictorial Annual. Vol. xi. The Process Year Book for 1905-6. Edited by William Gamble. Pp. xvi+168. (London: A. W. Penrose and Co., Ltd., 1905.)

LAST year, in bringing to the notice of our readers this annual illustrated review of the graphic arts, we suggested that the standard of the volume in every respect was so high that it would be exceedingly difficult to eclipse it in the future. We were, however, wrong in our surmise, for the present volume surpasses those that have preceded it and illustrates the high state of efficiency of processes in use at the present time.

In the production of such a volume the task of the editor was no light one, but with his large acquaintance with all process methods he has given us an excellent survey of the latest achievements in process work. As in previous issues, we have a number of most interesting articles on various methods of procedure and allied subjects, and mingled with them is a host of first-class illustrations indicating the type and quality of work that can be accomplished by the various processes now available. To mention a few of the host of illustrations, attention may be directed to the frontispiece, a specimen of power-press printed copper etching by Bruckmann, of Munich, examples of work with the metzograph screen, the new four-colour process of Mr. C. G. Zander, and the spray-relief process of the aërograph which illuminates the front of the cover of the volume. The reader must, however, refer to the book itself if he wishes to revel in high-class illustrations, for no object would be gained in referring any more here to the numerous pictures.

In concluding, one cannot but congratulate all those concerned in the production of this really beautiful volume. The book should not only be in the hands of all process workers, but in the possession of photographers and others interested in book illustration.

Philips' Large Planisphere. Designed by H. Gewecke. (London: G. Philip and Son, Ltd.) Price 6s.

MOST students of the aspects of the heavens are familiar with the small circular planisphere having a revolving disc which can be adjusted to show the stars visible at any time of the year. The new planisphere now available is constructed upon the same plan as the earlier one, but its diameter is about twenty inches, and some changes have been made with the view of adding to its usefulness. The horizon can be taken off so that the whole of the chart can be seen if desired. A graduated strip is arranged across the chart, and by means of it the position of an object can be found when the right ascension and declination are known. The scale of right ascension on the outer edge of the circular chart is in degrees, but it would have been more conveniently expressed in hours and minutes in the usual way.

The chart shows all the stars visible to the naked eye from the north celestial pole to 33° south of the celestial equator. The distortion is very great in some parts, and it is difficult to identify a few of the groups on this account and because the spots representing bright stars are so large. Fourth magnitude stars are represented by rings, and the effect is very unsatisfactory. A chart of this kind should aim at conveying a more or less faithful impression of the appearance of the stellar sky, but these white rings on a blue ground spoil the picture and ought not to have been introduced. Though the chart is said to have been "designed both for beginners and advanced students of astronomy," we are afraid that beginners would find it very confusing, and that working observers of the heavens would derive little real assistance from it.